III. REMARKS

Applicants thank the Examiner for indicating acceptance of the drawings, and for considering the references submitted in the 1/9/2004 and 6/30/2005 Information Disclosure Statements.

Claims 1-24 were presented for prosecution.

Claim Objections

Claims 3 and 23 were objected to because of the recitation "in at least one of absorption; fluorescence". Claim 13 was objected to because of the recitation "functionalized perylenes and binaphthyls; and dihydroxy-bipyridyles".

Applicants have corrected administrative errors regarding punctuation in claims 3 and 23 as shown in the claim amendments.

Rejection under 35 U.S.C. § 112

Claim 13 stands rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The grounds of rejection indicate that the recitation of "functionalized perylenes" is unclear to the Examiner. The Examiner questions "[w]hat constitutes a compound to be functionalized or not functionalized?" and states that the specification does not further disclose the "functionalized" and therefore appropriate corrections are required.

Applicants respectfully submit that the term "functionalized" as used in the art of functional chemistry is well known by those of ordinary skill in the art. In the present application, for example, perylenes used as dyes may be subject to functionalization processes to improve characteristics of the dyes such as their fluorescent properties. Applicants respectfully request that this rejection be withdrawn.

Rejection under 35 U.S.C. § 102(a) and 35 U.S.C. § 103(a) - Hakenjos et al.

Claims 1-7, 10, 11, 14-16, 18, 19, and 21-24 stand rejected under 35 U.S.C. § 102(a) as being anticipated by Hakenjos et al., *A PEM fuel cell for combined measurement of current and temperature distribution, and flow field flooding.* Claim12 stands rejected under 35 U.S.C. §103(a) as being unpatentable over Hakenjos et al. Applicants respectfully traverse this rejection.

Applicants note that the publication date of the Hakenjos et al. article in the Journal of Power Sources is listed on the face of the article as 2004. Specifically, the article citation is Journal of Power Sources 131 (2004) 213-216. Upon investigation of the article at the publisher's website <www.sciencedirect.com>, Applicants note that Volume 131 is dated May 14, 2004, *after* the filing date of the present application on January 9, 2004. Applicants understanding is that the received and accepted dates in October and November of 2003 listed on the article's front page are related to a peer review process that occurs before publication of a paper in the Journal of Power Sources. However, these dates are not dates of publication; rather May 14, 2004 is the publication date listed for the article. Applicants do note that in addition to the journal version of the Hakenjos et al. paper, the publisher's website lists the paper as being available *online* on a subscription basis on March 13, 2004. However, this date is also after the filing date of the present application.

Accordingly, Applicants respectfully request that the rejection of the claims in the Office Action using the Hakenjos et al. article be withdrawn.

Rejection under 35 U.S.C. § 102(b) – Lamont et al.

Claims 1-7, 10-12, 14-16, 18, 19, and 21-24 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Lamont et al. (U.S. Patent No. 5,763,765). Applicants respectfully traverse this rejection.

Lamont et al. is directed to a method and apparatus that detects and locates perforations in membranes used in electrochemical cells. The grounds of rejection cite the Lamont et al. reference as disclosing a test cell which includes an anode, a cathode and an optical window (citing Figure 1, component 12) to test perforations or leaks in the membrane of a fuel cell causing the fuel and oxidant streams to fluidly communicate and chemically react (citing column 1-2, lines 65-5).

The grounds of rejection further state that the Lamont et al. reference discloses that the anode and cathode reactions exothermically yield water (citing column 1, lines 50-55) and heat (citing the Abstract). Also, that an infrared thermal detector detects the heat generated and processes an image thereof.

Applicants respectfully submit that Lamont et al. does not disclose or suggest the features of independent claims 1 and 21. The present invention relates to measuring water of hydration in a polyelectrolyte membrane (PEM) of a fuel cell stack. Claim 1 recites "a source of input radiation directed at an input location on the PEM." In an exemplary embodiment in the present specification, this source of radiation may be embodied as a radiation source 34 that launches

input light 36-1 into an input waveguide (see Figure 1 and paragraph [0015]). The input light from the radiation source is directed through window 24 of the PEM, attenuated by the hydration level, and carried as output light 36-0 to the output waveguide 32 through window 26.

The Lamont et al. reference is silent with respect to a source of input radiation directed at an input location on a PEM. In Lamont et al., pressurized hydrogen-rich gas is applied to an interior side of a membrane electrode assembly. If there is a perforation in the membrane, then the hydrogen-rich gas on one side of the membrane will come into contact with air on the other side of the membrane, creating an exothermic reaction which can be detected by infrared camera 40 (see col. 5, lines 57-67). Applicants respectfully submit that hydrogen gas as disclosed in Lamont et al. would not be considered as a source of input radiation by one of ordinary skill in the art at the time of invention.

Further, independent claim 1 also recites a detector "for determining a sensible change in the input radiation indicative of a level of water hydration in the PEM." Lamont et al. uses an infrared detector to measure an exothermic reaction between hydrogen gas and air. There is no suggestion in Lamont et al. of detection of water hydration in a PEM.

Finally, since Lamont et al. does not disclose a source of input radiation directed at an input location on a PEM, it cannot disclose a change in the input radiation as recited in claim 1. Applicants respectfully submit that similar features are recited in independent method claim 21.

Applicants note that the grounds of rejection state that "The input location and the output location exist on the optical window in which the window absorbs IP light and outputs to the infrared camera." Applicant's review of the Lamont et al. reference reveals no explicit disclosure to an optical window. Should the rejection of the claims based on Lamont et al. not

be withdrawn based on the aforementioned arguments, the Examiner is kindly requested to discuss the alleged optical window in a non-final office action.

Rejection under 35 U.S.C. § 103(a) – Lamont et al. and Klienerman

Claims 3, 8 and 9 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Lamont et al. in view of Klienerman (U.S. Patent No. 5,560,712). The grounds of rejection acknowledge that Lamont et al. does not disclose a fluorophore operative to produce fluorescence in response to the input radiation. Yet, the grounds of rejection state that Kleinerman discloses that it is known to one of ordinary skill in the art for measuring temperature to include the use of probes made of materials having temperature-dependent photo-luminescence properties.

First, claims 3, 8, and 9 are allowable at least based on their dependency on claim 1 for the reasons discussed above. Next, Applicants respectfully submit that the grounds of rejection are improper since there is no discussion relating to any motivation or reason for the combining the of the references. Further, Klienerman relates to optical temperature sensors. Like Lamont et al, there is no disclosure of using the Klienerman optical temperature sensor to indicate a level of water hydration in a PEM.

Claims 13, 17 and 20 also stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lamont et al. in view of Klienerman.

The grounds of rejection acknowledge that Lamont et al. does not disclose utilizing a fluorescent dye selected from the group comprising functionalized perylenes and binaphthyls and

dihydroxy bipyridyles and wherein the input and the output windows are optically aligned on opposite sides of the PEM; features recited in claims 13, 17, and 20. Rather, the grounds of rejection state that these deficiencies in Lamont et al. are disclosed in Kleinerman alleging disclosure of a new technique in which the input and the output windows are optically aligned on opposite sides of the PEM and which uses fluorescent dyes such as bis-benzanthrone (citing column 5, lines 1-10).

First, Applicants respectfully submit that claims 13, 17, and 20 are allowable at least based on their dependency on claim 1 for the reasons discussed above. Next, the "dyes" cited as being used in the Klienerman device at col. 5, lines 1-10 are used as cladding of an optical sensor. In the present invention, the dyes are used as a material forming the PEM in exemplary embodiments. There is no suggestion of using dyes in a PEM in Klienerman. Further, Applicants fail to see how dyes would be incorporated into the Lamont et al. device since Lamont et al. measures exothermic reactions between hydrogen-rich gas and air without an input source of radiation, or even without an optical sensor.

Rejection under 35 U.S.C. § 103(a) – Lamont et al. and Yamashita et al.

Claims 3 and 20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Lamont et al. in view of Yamashita et al. (JP Publication 2001-124695). Claims 3 and 20 are allowable at least based on their dependency on claim 1 for the reasons discussed above.

Applicants do not acquiesce in the correctness of the rejections above and reserve the right to present specific arguments regarding any rejected claims not specifically addressed. Further, Applicants reserve the right to pursue the full scope of the subject matter of the claims in a subsequent patent application that claims priority to the instant application.

Applicants respectfully submit that the application is in condition for allowance. If the Examiner believes that anything further is necessary to place the application in condition for allowance, the Examiner is requested to contact Applicant's undersigned representative at the telephone number listed below.

Respectfully submitted,

//Mark. A. Conklin//

Reg. No. 39,148

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